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INT CL[5] F16H

(54) **Power transmission apparatus, sprocket means used therein, and passenger conveyer using the same**

(57) A power transmission apparatus comprises a load carrying chain 6, a main sprocket 2 engaged with the load carrying chain 6 for driving the load carrying chain 6, driven spocket 8 having the same number of teeth as ones of the main sprocket 2 and fixed to a shaft 7 on which the main sprocket 2 is mounted, a drive chain 13, wound on the driven sprocket 8 to rotate the driven sprocket 8 and having the same tension direction thereof to a radial line passing a tooth of the driven sprocket 8, from which the drive chain 13 starts to separate, as a tension direction of the load carrying chain 6 to a radial line passing a tooth of the main sprocket 2, at which the main sprocket 2 starts to wind the load carrying chain 6, and a drive machine 9 for driving the drive chain 13. A passenger conveyer employs the above power transmission apparatus for movement of pallet treads 4 and handrails 17.

FIG. 2

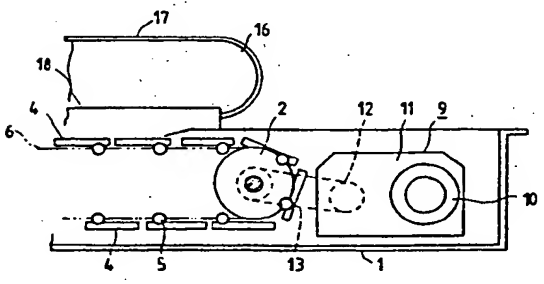
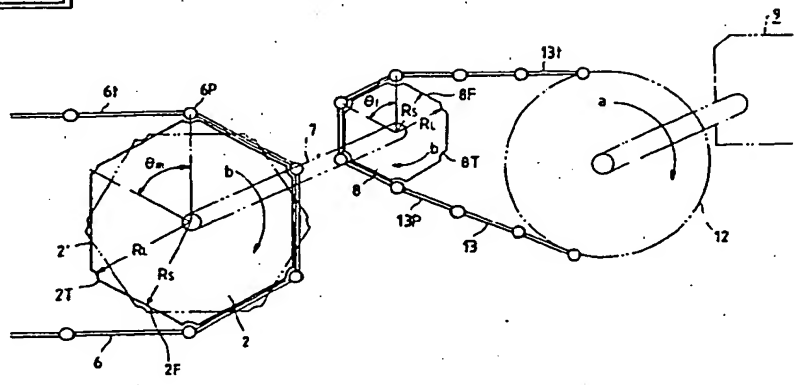


FIG. 4



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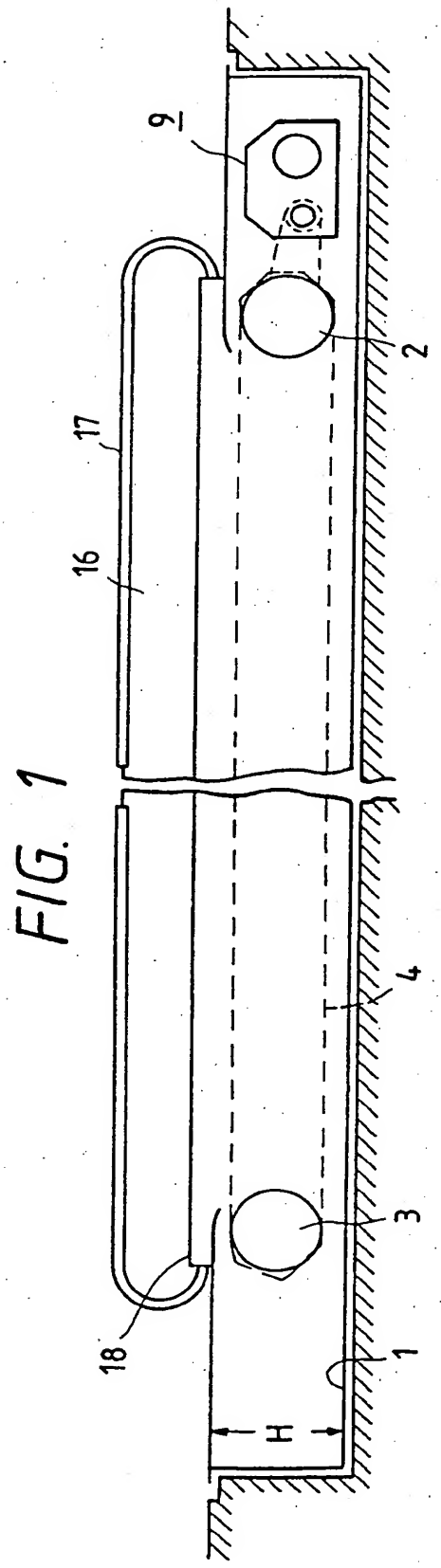


FIG. 1

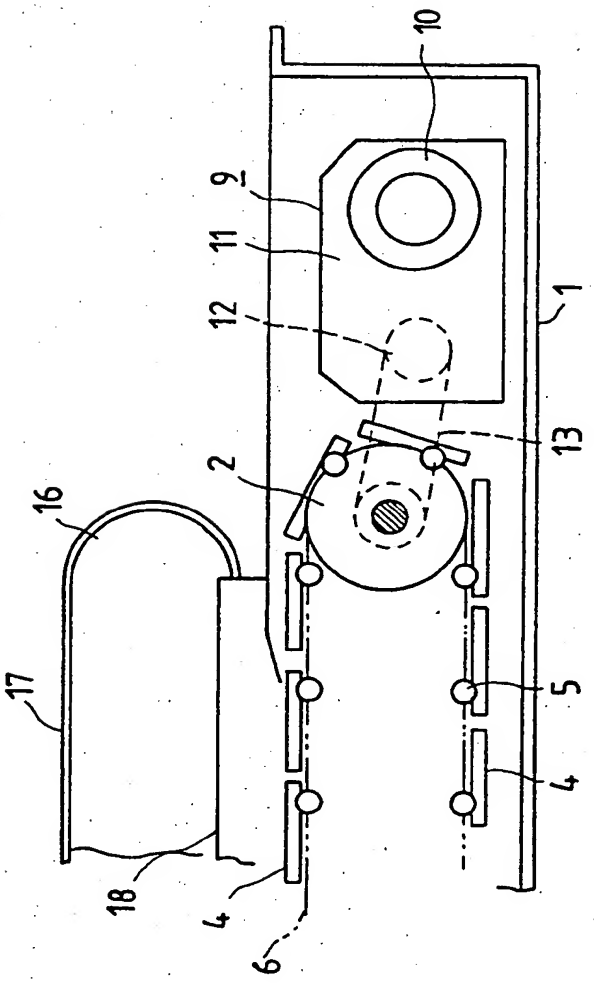


FIG. 2

FIG. 3

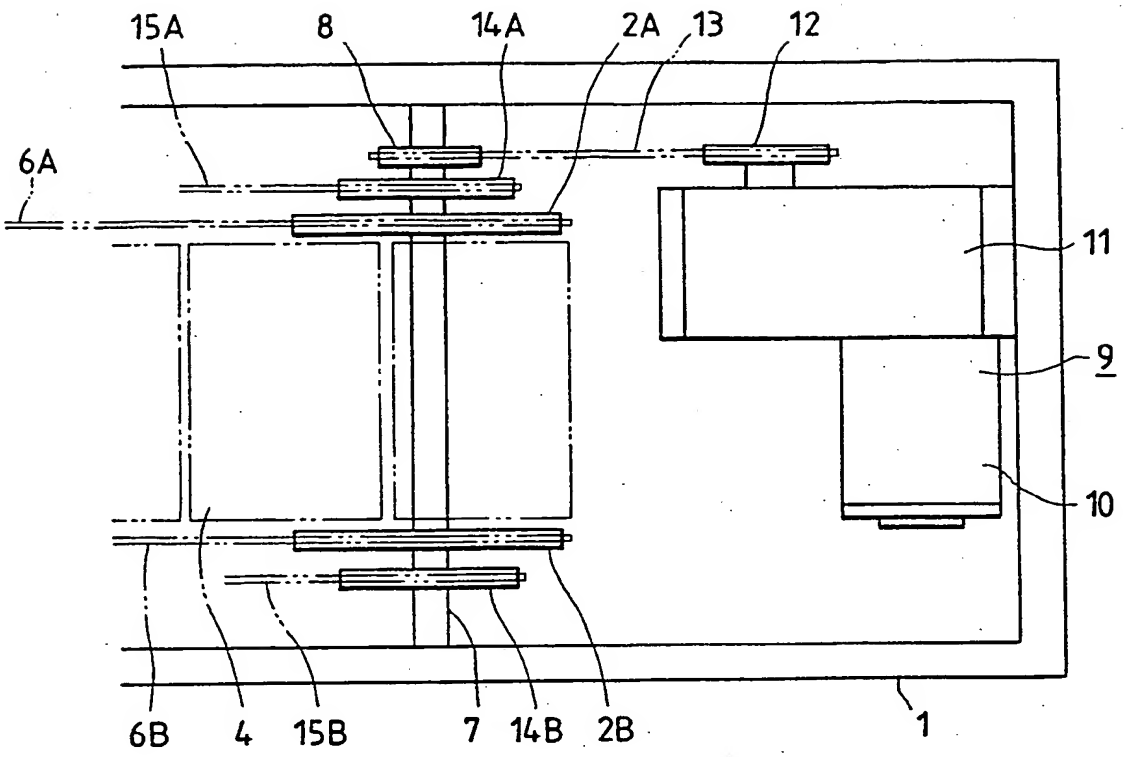


FIG. 5

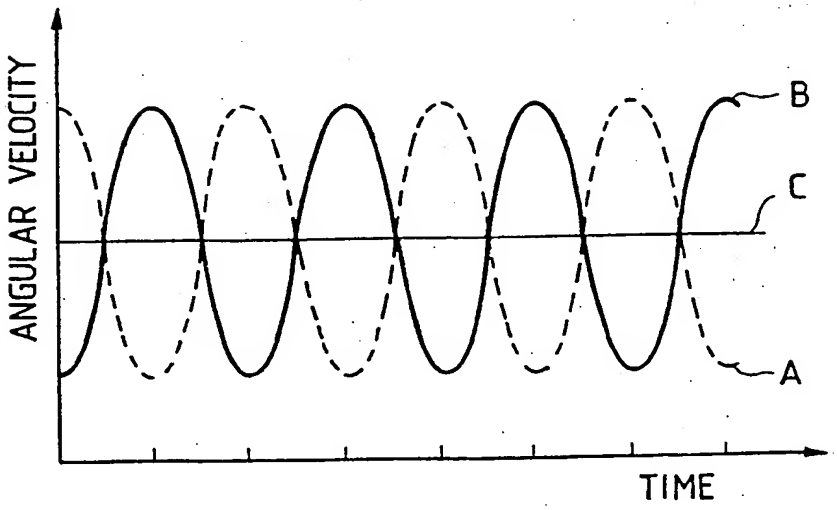


FIG. 4

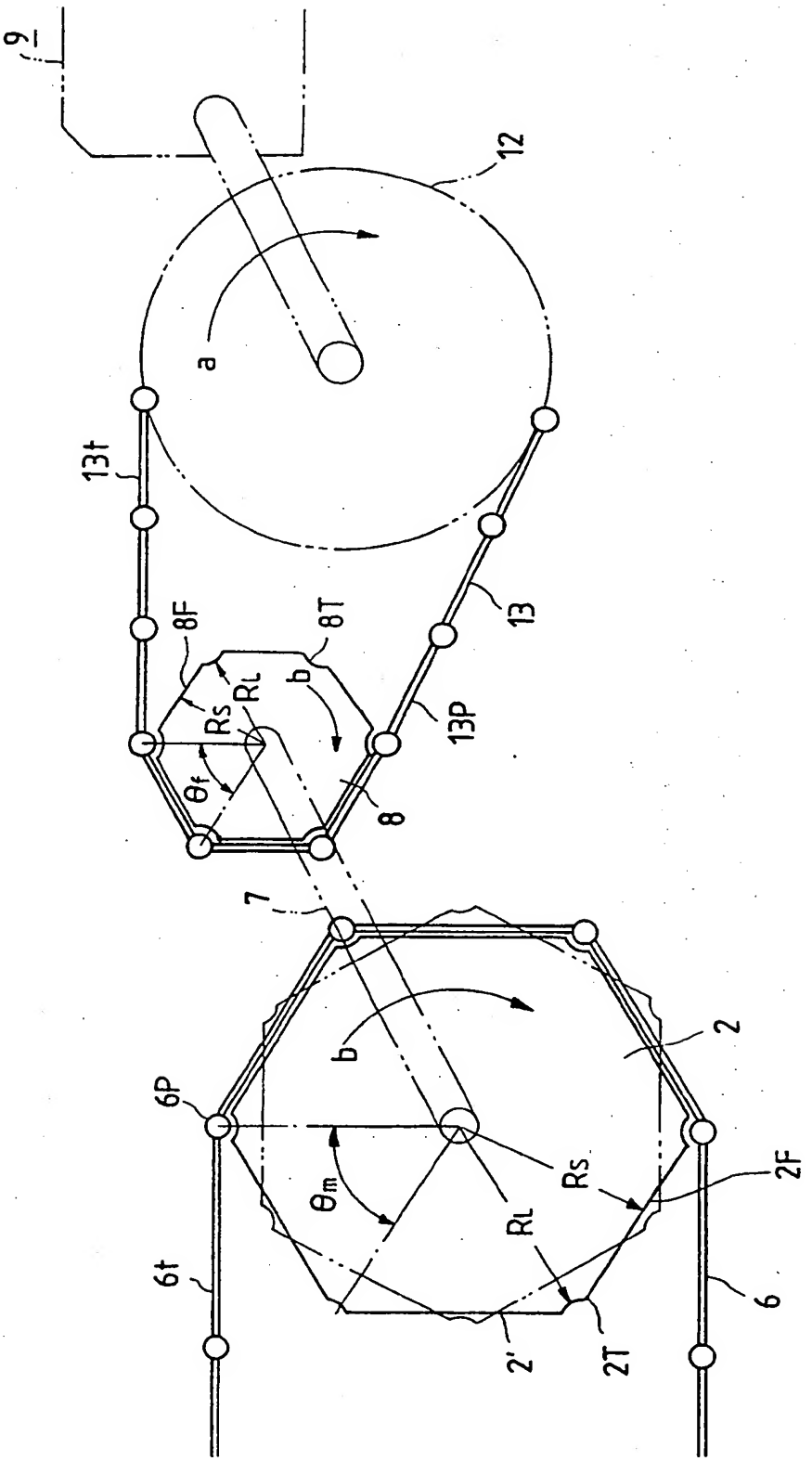


FIG. 6

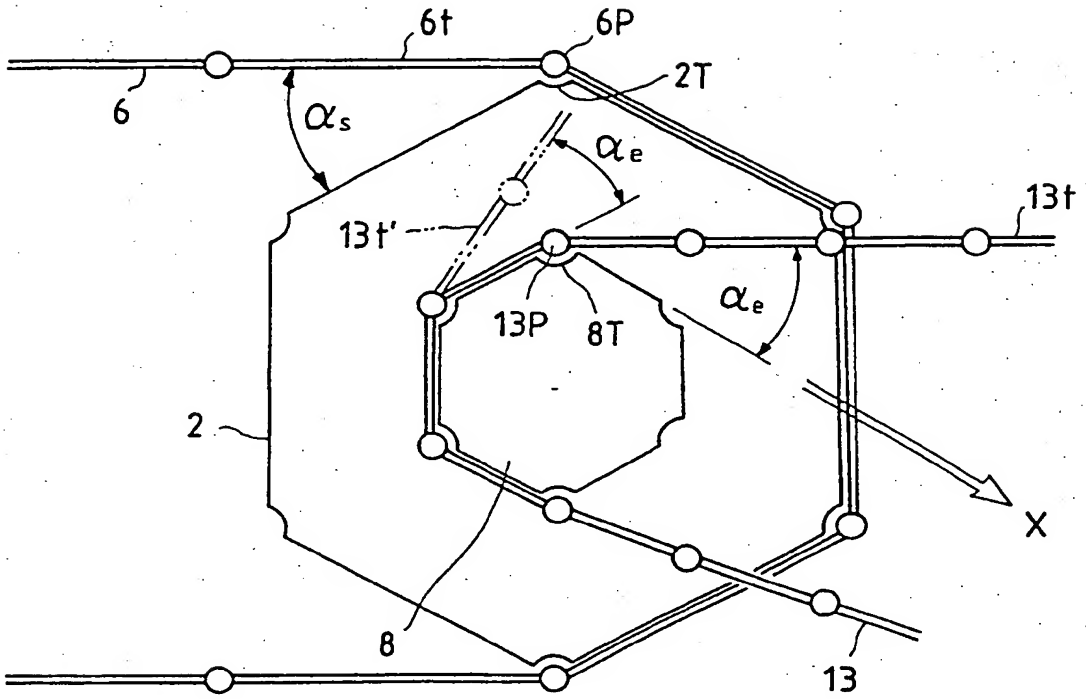


FIG. 7

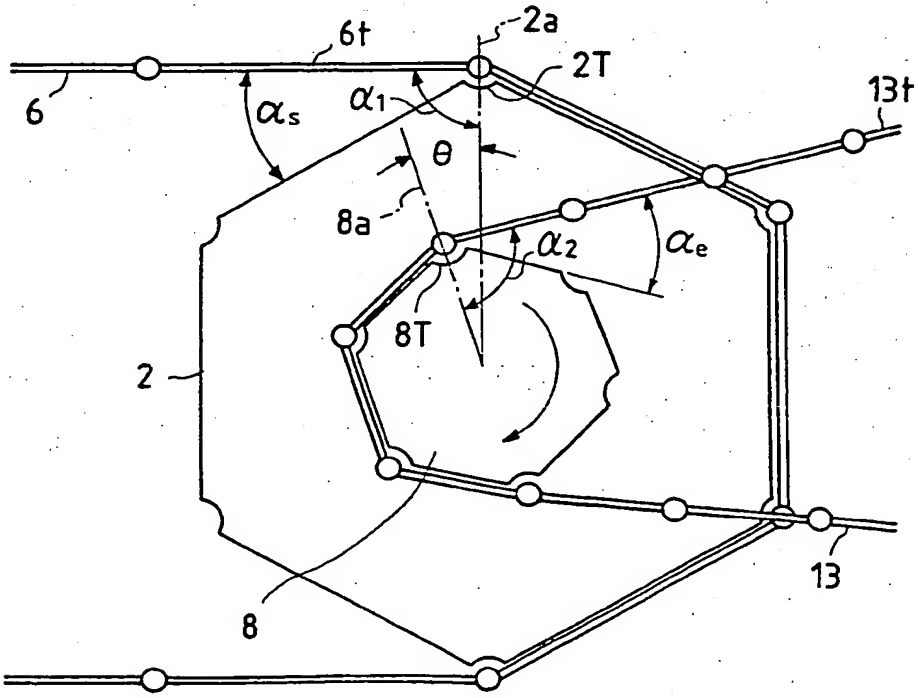
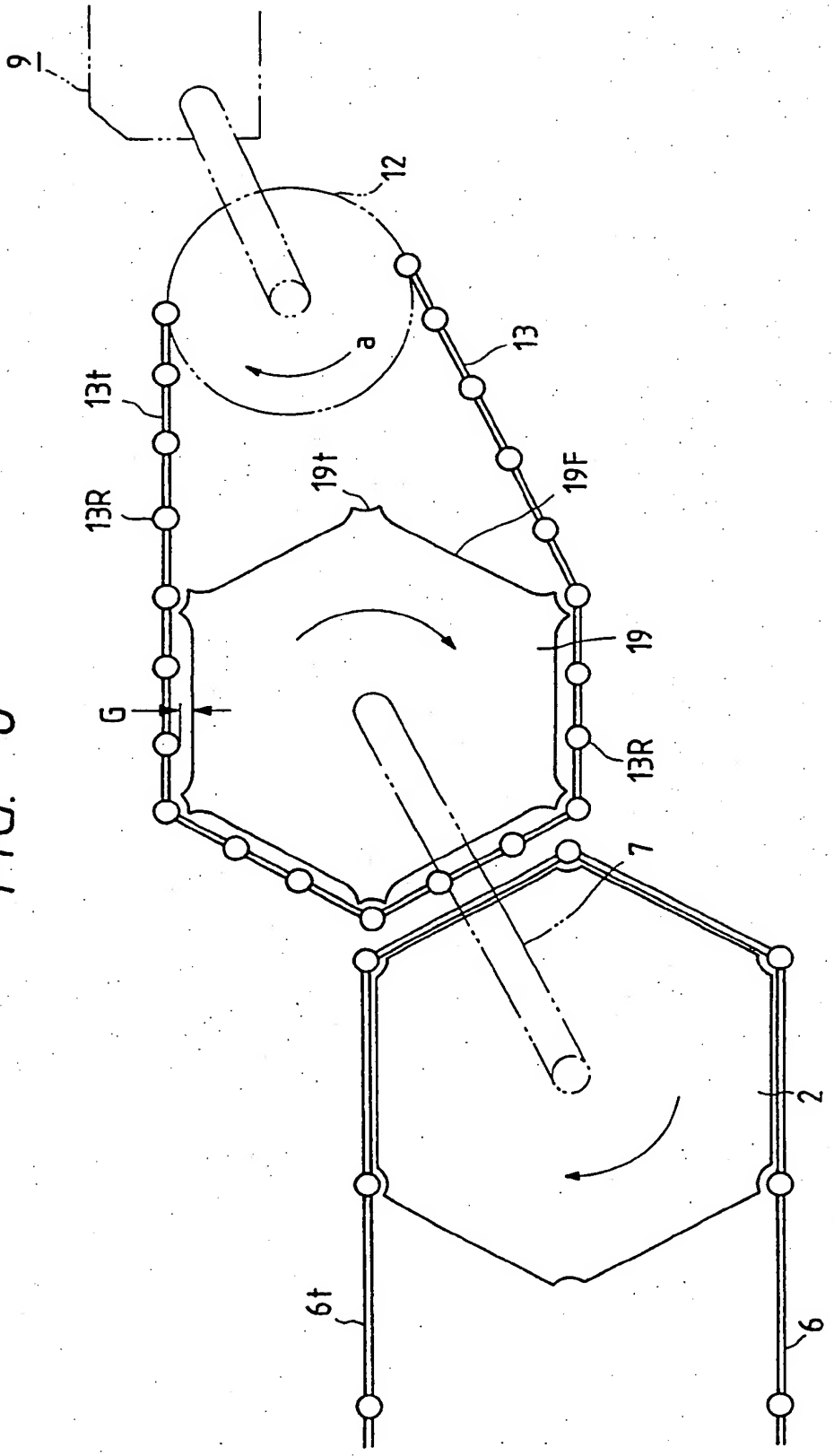


FIG. 8



POWER TRANSMISSION APPARATUS, SPROCKET MEANS USED THEREIN, AND PASSENGER CONVEYER USING THE SAME

The present invention relates to a power transmission apparatus employing sprockets and chains, sprocket means for use in the apparatus, and a passenger conveyer employing the power transmission apparatus.

A conventional moving walk, which is a kind of passenger conveyer, is constructed so that a plurality of pallet treads are connected to endless pallet chains which are wound on sprockets spaced from each other and main ones of the sprockets to which rotating force is imparted to move the pallet treads, which is disclosed in JP-A-61-130197. The sprockets each are supported by a frame elongated along a running direction of the treads, and disposed within the width, that is, height of the frame.

In this construction, any consideration is not given on the height of the frame of the moving walk. In order to miniaturize the moving walk, it is necessary to reduce the height of the frame. The reduction of the frame height necessitates reduction of the diameter of the sprockets supported by the frame. The sprockets reduced in diameter cause pulsation in traveling movement of the chains driven by the sprockets, so that the height reduction of the frame is bar to miniaturize the moving walk.

An object of the invention is to provide a passenger conveyer which is able to be reduced in frame height without causing pulsation in traveling movement of pallet treads.

Another object of the invention is to provide a power transmission apparatus which has a load carrying chain driven by a main sprocket and which can be reduced in diameter of the main sprocket without causing pulsation in the load carrying chain.

The present invention is characterized in that a load carrying chain is wound on a main sprocket reduced in diameter, and there is provided means for imparting such pulsation to rotation of the main sprocket that cancel pulsation in travelling movement, which might be caused otherwise by the main sprocket reduced in diameter. The means for imparting pulsation to rotation of the main sprocket comprises a driven sprocket, fixed to a shaft on which the main sprocket is mounted, having the same number of teeth as the main sprocket, and a drive chain, wound on said driven chain and having the same tension direction or angle thereof to a radial line passing a tooth of said driven sprocket from which the drive chain starts to separate as a tension direction or angle of the load carrying chain to a radial line passing a tooth of said main sprocket at which the load carrying chain starts to be wound.

A sprocket reduced in pitch circle diameter presents a polygonal shape. When the polygonal sprocket is rotated at a constant angular velocity, a chain driven by the sprocket runs at a running speed with pulsation corresponding to the number of teeth of the sprocket. According to the present invention, in order to cause the running or travelling of the chain driven by the sprocket to be free from pulsation, pulsation corresponding to the number of the teeth of the sprocket is given to rotational movement of the sprocket, so that the sprocket rotates with the pulsation and the travelling of the chain driven by the sprocket is free from the pulsation, for example, a constant speed.

An aspect of the present invention is directed to a power transmission apparatus, and another aspect of the invention is directed to a passenger conveyer employing the power transmission apparatus.

In a passenger conveyer according to the present invention, a height of a frame which supports various structural components of the passenger conveyer can be reduced by reduction of the diameter of a main sprocket thereof wound by a load carrying chain without causing pulsation in traveling movement of the chain, that is, in the movement of pallet treads driven by the chain.

In the accompanying drawings:-

Fig. 1 is a side brief view showing an electrically moving walk driven by the power transmission apparatus according to the present invention;

Fig. 2 is an enlarged view showing a surrounding of a main sprocket in Fig. 1;

Fig. 3 is an enlarged plan view of Fig. 2;

Fig. 4 is a view showing a principle of an embodiment of a power transmission apparatus according to the present invention;

Fig. 5 is an illustration showing a relation between angular velocity of the main sprocket and change in running speed of a chain wound on the main sprocket;

Figs. 6 and 7 each are a brief side view showing a relation between each sprocket and each chain; and

Fig. 8 is a view of a principle of another embodiment of a power transmission apparatus according to the present invention.

An embodiment of the invention will be explained hereunder on Figs. 1 to 6. The embodiment shown here is a passenger conveyer installed horizontally on a road, that is, an electrically moving walk.

In Figs. 1 to 3, a pair of main sprockets 2 (2A, 2B) are supported by a shaft 7 at a longitudinal one side of a frame 1 disposed horizontally, and a pair of assistant

sprockets 3 are supported by a shaft (not shown) at the other longitudinal side. Two pallet chains 6 (6A, 6B) which are main chains carrying load are wound on or engaged with the main and assistant sprockets 2 and 3. A plurality of pallet treads 4 are disposed between and connected to the two pallet chains 6A, 6B.

Although concrete illustration of the connection of the pallet treads 4 to the pallet chains 6A, 6B is omitted, shafts supporting rolling rollers 5 project at both widthwise ends of the pallet treads 4, and the shafts are connected to the pallet chains 6A, 6B. The rolling rollers 5 roll on guide rails (not shown) supported by the frame 1 to move the pallet treads 4 on fixed positions. The main and assistant sprockets 2 and 3 are fixed to the rotation shafts 7 so that the pallet treads 4 move between the main and assistant sprockets 2 and 3.

The main sprocket 2 is rotated by a drive machine 9 disposed within the frame 1. The pair of main sprockets 2A, 2B are fixed to the rotation shaft 7 which is rotatably supported by the frame 1. A driven sprocket 8 is fixed to the rotation shaft 7 at the outside of the pair of main sprockets 2A, 2B, and power of the drive machine 9 is transmitted to the driven sprocket 8. The drive machine 9 comprises an electric motor 10, a reduction gear 11 to whose output shaft 1 the electric motor 10 is connected, and a drive sprocket 12 fixed to the output shaft of the reduction gear 11. A drive chain

13 is wound on the drive sprocket 12 and the driven sprocket 8. Further, a pair of handrail driving sprockets 14A, 14B are fixed to the rotation shaft 7 at the outside of the pair of main sprockets 2A, 2B, and handrail driving chains 15A, 15B each are wound on the sprockets 14A, 14B. A handrail driving apparatus not shown is driven by the handrail drive chains 15, 15B, whereby moving handrails 17 which is described later is moved synchronously with the pallet treads 4.

On the other hand, a balustrade panel 16 which is supported by the frame 1 is arranged in the moving directions of the pallet treads 4, and the moving handrail 17 is movably supported around the periphery of the balustrade panel 16. A lower part of the balustrade panel 16 is covered with a cover 18.

In the electrically moving walk of the above-mentioned construction, when the power source of the electric motor 10 is turned on by an operator, the electric motor 10 rotates the driven sprocket 8 through the reduction gear 11, the drive sprocket 12, and the drive chain 13. The rotation of the driven sprocket 8 rotates the main sprockets 2A, 2B and the handrail drive sprocket 14A, 14B on the same shaft, and the main sprockets 2A, 2B move the pallet chains 6A, 6B to move the pallet treads 4 connected to the pallet chains 6A, 6B. At the same time, the handrail drive sprockets 14A, 14B drive the handrail drive apparatus through the

handrail drive chains 15A, 15B to move the moving handrails 17.

The main sprocket 2 (2A, 2B) and the assistant sprocket 3 have diameters made small to reduce the height H (shown in Fig. 2) of the frame 1, whereby the number of teeth of the main and assistant sprockets 2, 3 become small. When the number of teeth are made small, the main sprocket 2, which is on the drive side of the pallet chain 6, becomes polygonal as shown by 2 and 2' in Fig. 4 and rotation radius changes alternatively. Under this conditions, when the main sprocket 2 rotates at a certain constant angular velocity w, a peripheral velocity v of the main sprocket 2 changes, that is, a peripheral velocity v of a tooth part 2T at which the radius RL is maximum becomes maximum, and peripheral velocity v of the central part 2F between adjacent teeth at which the radius Rs is minimum becomes minimum. As mentioned above, a running speed or winding speed of the tension side 6t of the pallet chain 6 engaged with the sprocket 2 which is provided with different peripheral velocity parts in the outer periphery, is as shown by A in Fig. 5, and has pulsation. Pulsation in the pallet chain 6 is transmitted to the pallet treads 4 connected thereto, of course, whereby uncomfortable feeling is given the passengers on the pallet treads 4.

Such feeling can be avoided if the construction is made such that any change does not occur in velocity of

the pallet chain 6 wound by the main sprocket 2, that is, the main sprocket rotates not at a fixed angular velocity. In this embodiment, as shown in Fig. 4, the number of teeth 8T of the driven sprocket 8 coaxial with the main sprocket 2 and a phase angle θf of the teeth 8T are made coincident with the number of teeth 2T of the main sprocket 2 and a phase angle θm of the teeth 2T, respectively, and the tension side 6t of the pallet chain 6 and the tension side 13t of the drive chain 13 are made parallel to each other. By forming the main sprocket 2 and the driven sprocket 8 in this manner, the velocity at which the pallet chain 6 is wound up by the main sprocket 2 can be made constant. Namely, in Fig. 4, when the main drive sprocket 12 rotates in a direction of an arrow (a), the driven sprocket 8 receives tensile force of the tension side 13t of the drive chain 13 and is rotated in a direction of an arrow (b). Here, the drive sprocket 12 has sufficiently many numbers of teeth, so that a relation of the sprocket 12 with the drive chain 13 is in an arc condition, and a running speed of the drive chain 13 has no pulsation to be constant. On the other hand, the driven sprocket 8 driven by the drive chain 13 which runs at a fixed speed has a small diameter, small members of teeth 8T and a polygonal shape. When such a driven sprocket 8 as mentioned above is rotated by the drive chain 13, the running speed of the drive chain 13 becomes constant, so that the angular velocity w of the tooth

part 8T at which the radius RL is maximum becomes minimum, and the angular velocity w of the central portion 8F between the adjacent teeth at which the radius Rs is minimum becomes maximum, whereby the angular velocity of the driven sprocket 8 has pulsation as shown by B in Fig. 5.

As mentioned above, the main sprocket 2 which is coaxial with the driven sprocket 8 rotating and has the same tooth number and the same phase angle as the driven sprocket 8, also rotates at the angular velocity having the same pulsation as the driven sprocket 8 in a direction of an arrow (b). Therefore, the running speed of the tension side 6t of the pallet chain 6 engaged with the main sprocket 2 pulsates as shown by A in Fig. 5 when the main sprocket is rotated at a fixed angular velocity, but the sprocket rotates at an angular velocity which pulsates as shown by B, as a result, the angular velocity becomes constant as shown by C. Explaining more definitely, when the tooth part 2T at which the radius RL of the main sprocket 2 is positioned at a position shown by a solid line in Fig. 4, that is, when the angular velocity of the driven sprocket 8 becomes minimum, the radius RL of a part 6P at which the pallet chain 6 starts to be wound becomes maximum. On the contrary, when the main sprocket 2' is positioned at a position shown by a two dotted line in Fig. 4, the radius Rs becomes minimum, and the angular velocities of the driven sprocket 8 and the main sprocket

2' becomes maximum at that time, so that a product of the velocity and the radius at each place of the peripheral portion of the main sprocket 2 becomes constant, and the winding speed of the pallet chain 6 becomes constant. As a result, the pallet treads 4 connected to the pallet chain 6 also is moved stably.

In the above explanation, the tension side 6t of the pallet chain 6 is made in parallel to the tension side 13t of the drive chain 13, which is for the reason that the driven sprocket 8 and the main sprocket 2 have the same peripheral velocity as each other. Namely, in Fig. 6, if the tension side of the drive chain 13 is pulled in the direction of an arrow (x) at a position that the radius of the driven sprocket 8 is minimum, the angular velocity, at that time, of the driven sprocket 8 becomes maximum in inverse proportion to the minimum radius since the periphery velocity or the running speed of the drive chain 1 is constant, so that the main sprocket 2 rotates at the maximum angular velocity. On the other hand, at that time, since the pallet chain 6 is pulled at a point that the radius of the main sprocket 2 becomes maximum, the periphery velocity of the main sprocket 2 at the time when the angular velocity is maximum, that is, the running speed of the pallet chain 6 becomes maximum by a product of the maximum angular velocity and the maximum radius. Next, when the tension side of the drive chain 13 comes to a position that the radius of the driven sprocket 8

becomes maximum the angular velocity becomes minimum in inverse proportion to the maximum radius, and the angular velocity of the main sprocket 2 also becomes minimum. At that time, the pallet chain 6 is pulled at a point that the radius of the main sprocket 2 is minimum, so that the running speed becomes minimum by a product of the minimum angular velocity and the minimum radius. Accordingly, the pulsation is caused in the running speed of the drive chain 6.

In this manner, if a relation of the tension side 13t of the drive chain 13 to the driven sprocket 8 is not the same as a relation of the tension side 6t of the pallet chain 6 to the main sprocket 2, pulsation in the drive chain 6 can not be suppressed or reduced.

As mentioned above, the number of teeth and the phase angle of the teeth of the main sprocket 2 and the driven sprocket 8 are made coincident, and the tension side 6t of the pallet chain 6 is made in parallel to the tension side 13 of the drive chain 13, whereby a relation of each chain to each sprocket, for example, a winding termination angle αe of a winding termination part 13p of the drive chain 13 to a tooth 8t of the driven sprocket 8 is naturally equal to a winding start angle αs of a winding start 6p of the pallet chain 6 to a tooth 2T of the main sprocket 2, and a winding speed of the pallet chain 6 becomes constant.

Accordingly, instead of the tension side 6t and the tension side 13t being parallel, the tension side can be pulled as shown by a two-dotted line 13t' in Fig. 6 so that the winding start angle αs and the winding termination angle αe are equal to each other.

In the above explanation, in order to make a constant winding speed of the pallet chain 6 by the main sprocket, the number and phase angle of teeth of the main sprocket 2 and the driven sprocket 8 are made coincident, further the winding start angle αs and the winding termination angle αe of the pallet chain tension side 6t and the drive chain tension side 13t are made the same as each other. However, even if the phase angle of the teeth is deviated by an angle of θ as shown in Fig. 7, for example, if the conditions that the tooth numbers are made the same as each other, and that the winding start angle and the winding termination angle are made coincident are satisfied, the winding speed of the pallet chain 2 by the main sprocket 2 can be made constant.

The winding start angle αs can be replaced by a tension angle α_1 or direction of the pallet chain 6t to a radial line 2a passing the tooth 2T of the main sprocket 2 at which the pallet chain 6t start to be wound on the main sprocket 2, and the winding termination angle αe can be replaced by a tension angle α_2 or direction of the drive chain 13 starts to separate from the driven sprocket 8. When the tension angles α_1 and α_2 are made equal to each other, the pallet chain 6 can run without pulsation.

In the embodiment as explained above, since the driven sprocket 8 is smaller in diameter and less in the number of teeth than the drive sprocket 12, rotational speed of the drive sprocket 12 is increased. A construction for reduction of the rotational speed will be explained referring to Fig. 8. An arrangement of the main sprocket engaged with the pallet chain 6, the driven sprocket 19 fixed to the same shaft to which the main sprocket 2 is fixed, the drive sprocket 12 of the drive machine 9, and the drive chain 13 engaged with the drive sprocket 12 and the driven sprocket 19 is the same in Fig. 1. Here, although the number of teeth of the drive sprocket 12 is sufficiently many, the number of the teeth 19T of the driven sprocket 19 is substantially little because the teeth 19T are formed not for each pitch of chain rollers 13R of the drive chain 13, but formed so as to mesh with at integer times, for example, at each three pitches. The chain rollers 13R positioned between the teeth 19T each have a gap G not to contact with the driven sprocket 1. Therefore, a larger reduction ratio can be taken than a tooth number ratio between two sprockets, the drive sprocket 12 and the driven sprocket 19.

Further, the number and the phase angle of the teeth in the main sprocket 2 and the driven sprocket 19, and a relation between the tension side 6t of the pallet chain 6 and the main sprocket 2 and a relation of the tension side 13t of the drive chain 13 to the drive sprocket 19

are the same, respectively, which is the same as in the previous embodiment.

In the above construction, when the drive sprocket 12 rotates in a direction of an arrow (a), the pallet chain 6 is moved through the drive chain 13, the driven sprocket 19, the rotation shaft 7 and the main sprocket 2 at a running speed decelerated on the same principle as in the previously stated embodiment.

In the above embodiment, the drive chain 13 is engaged with the driven sprocket 19 so as to mesh at each plurality of pitches, so that a large reduction ratio can be taken even if the pitch circle is made larger by increasing the number of teeth of the drive sprocket 12 by decreasing the pitch circle of the driven sprocket 19, on the contrary.

In each embodiment as explained above, as an example of a passenger conveyer, the electrically moving walk horizontally arranged is explained, however, the embodiment can be applied to an electrically moving walk, constructed by a frame comprising an upper horizontal part, a lower horizontal part and an inclination part therebetween, and arranged inclined against a construction, and to an escalator.

Besides, a construction shown in Fig. 4 or 7 can be used as a power transmission apparatus for a chain conveyer and transfer apparatus which dislike pulsation in running speed of chains.

As explained above, according to the present invention, even if the main sprocket is reduced in diameter, a power transmission apparatus can be obtained which does not impart pulsation to a running speed of a chain driven by the main sprocket. By employing the power transmission apparatus, a passenger conveyer which can be reduced in height of a frame can be obtained.

CLAIMS

1. A power transmission apparatus comprising:

a load carrying chain;

a main sprocket engaged with said load carrying chain for driving said load carrying chain;

a driven sprocket having the same number of teeth as ones of said main sprocket and fixed to a shaft on which said main sprocket is mounted;

a drive chain, wound on said driven sprocket to rotate said driven sprocket and having the same tension direction thereof to a radial line passing a tooth of said driven sprocket, from which said drive chain starts to separate, as a tension direction of said load carrying chain to a radial line passing a tooth of said main sprocket, at which said main sprocket startsto wind said load carrying chain; and

a drive machine for driving said drive chain.

2. A power transmission apparatus according to claim 1, wherein said main sprocket and said driven sprocket are mounted on the same shaft to be coincident with each other in phase angle thereof.

3. A power transmission apparatus according to claim 2, wherein said tension directions of said load carrying chain and said drive chain are in parallel to each other.

4. A power transmission apparatus according to claim 1, wherein said drive machine has a drive sprocket, engaged with said drive chain to drive said driven sprocket and having a larger diameter than said driven sprocket.

5. A power transmission apparatus according to claim 1, 2 or 3, characterized in that said drive machine has a drive sprocket of which the number of teeth is larger than that of said driven sprocket.

6. A power transmission apparatus according to claim 1, 2 or 3, characterized in that said drive machine has a drive sprocket which has a smaller diameter and a larger teeth number than said driven sprocket.

7. A power transmission apparatus comprising a main sprocket driven by a drive machine, a main chain wound on said main sprocket and a driven body to be driven by said main chain, characterized by means operatively connected to said drive machine for imparting pulsation corresponding to the number of teeth of said main sprocket to rotational movement of said main sprocket so that travelling movement free from pulsation is caused in said main chain.

8. A power transmission apparatus according to claim 7, wherein said means comprises a driven sprocket, fixed to

a shaft on which main sprocket is mounted and having the same number of teeth as said main sprocket, and a drive chain wound on said driven sprocket, and driven by said drive machine.

9. A power transmission apparatus according to claim 8 wherein a running speed of said main chain is constant.

10. A power transmission apparatus according to claim 8, wherein said main sprocket and said driven sprocket each have a polygonal shape such that when a winding radius of said main sprocket is maximum, a rotational speed of said driven sprocket is minimum.

11. A power transmission apparatus comprising:

a drive machine having a first sprocket fixed to an output shaft of a reduction gear driven by an electric motor;

a first chain wound on said first sprocket;

a second sprocket wound by said first chain;

a third sprocket fixed on a shaft on which said second sprocket is fixed;

a second chain wound on said third sprocket; and

a driven body driven by said second chain,

characterized in that said second and third sprockets are formed to be equal to each other in the number of teeth and a phase angle of the teeth, and a winding start angle

of said second chain on a tooth of said third sprocket is coincident with a winding termination angle of said first chain from a tooth of said second sprocket.

12. A power transmission apparatus according to claim 11, wherein a pitch of teeth of said second sprocket is integer times as much as a pitch of chain rollers of said first chain.

13. A power transmission apparatus, characterized in that a portion between adjacent teeth of said second sprocket faces a portion between chain rollers of said first chain with a gap therebetween.

14. Sprocket means for a power transmission apparatus characterized in that two kinds of sprockets are fixed to a same shaft, and formed so as to be same in the number and phase angle of teeth thereof.

15. Sprocket means for a power transmission apparatus according to claim 14, wherein said two kinds of sprockets have the same diameter as each other.

16. A passenger conveyer comprising:

an endless pallet chain having a plurality of pallet treads connected thereto,

a pair of sprockets spaced from each other and engaged with said pallet chain to circulate said pallet chain, one of said sprockets at a drive side being a main sprocket,

a frame supporting said pair of sprockets,

a drive machine supported by said frame for driving said main sprocket, and

a moving handrail moving synchronously with said pallet treads, characterized by means operatively connected to said drive machine for imparting pulsation corresponding to the number of teeth of said main sprocket to rotational movement of said main sprocket so that travelling movement free from pulsation is caused in said main chain.

17. A passenger conveyer comprising:

an endless pallet chain having a plurality of pallet treads connected thereto;

a pair of sprockets spaced from each other and engaged with said pallet chain to circulate, one of said pair of sprockets at a drive side being a main sprocket;

a frame supporting said pair of sprockets;

a drive means supported by said frame for driving said main sprocket; and

a moving handrail moving synchronously with said pallet treads, characterized in that said drive means

comprises a drive sprocket, a driven sprocket fixed to a shaft to which said main sprocket is fixed and having the same number of teeth as said main sprocket and a drive chain wound on said drive sprocket and said driven sprocket, and having the same tension angle to a line passing the center of said driven sprocket and a tooth of said driven sprocket at which said drive chain separates from said driven sprocket as a tension angle to a line passing the center of said main sprocket and a tooth of said main sprocket at which said pallet chain starts to be wound on said main sprocket.

18. A passenger conveyer according to claim 17, wherein another endless pallet chain is provided, said two pallets chains are disposed at left and right sides of said pallet treads, respectively, and another main sprocket which is the same as said main sprocket, and said pallet chains are driven by said two main sprocket.

19. A passenger conveyer according to claim 17, wherein said frame is disposed horizontally.

20. A passenger conveyer according to claim 17, wherein said frame comprises an upper horizontal part, a lower horizontal part, and an inclination part between said upper horizontal part and said lower horizontal part.

21. A passenger conveyer comprising:

endless pallet chain means having a plurality of pallet treads connected thereto;

sprocket means wound by said pallet chain means to circulate said pallet chain means, said sprocket means including main sprocket means disposed at a drive side;

a frame supporting said sprocket means;

moving handrail means disposed at side of said pallet treads;

a handrail driving means supported by said frame for driving said moving handrail means;

a drive machine supported by said frame and having a drive sprocket;

a driven sprocket fixed to a shaft mounting said main sprocket means thereon and having the same number of teeth as said main sprocket means;

a drive chain wound on said driven sprocket to drive said driven sprocket thereby driving said main sprocket means and having the same tension angle to a radial line passing a tooth of said driven sprocket at a chain winding termination position as a tension angle of said pallet chain means to a radial line passing a tooth of said main sprocket means at a chain winding start position;

a handrail sprocket fixed to said shaft; and

a handrail drive chain wound on said handrail sprocket.

22. A passenger conveyor according to claim 21, wherein said main sprocket means comprises a pair of main sprockets fixed to the shaft with a space therebetween, said handrail drive sprocket means comprises a pair of sprockets disposed outside said pair of main sprockets, respectively, and said drive sprockets are arranged so as to be positioned outside said pair of handrail drive sprockets.

23. A power transmission apparatus substantially as described herein, with reference to any of the accompanying drawings.

24. Sprocket means substantially as described herein with reference to any of the accompanying drawings.

25. A passenger conveyor substantially as described herein with reference to any of the accompanying drawings.

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